

Claims:

1. A catheter for intravascular corporeal cooling which comprises:

5 an elongated tubular member having proximal and distal sections, at least two lumens extending therethrough, an outer surface, and an outer wall,

10 an inflatable annular balloon positioned on the outer surface of the elongated tubular member, and

15 pressure relief means positioned in the external wall of the elongated tubular member and proximal to the annular inflatable balloon, wherein at least one lumen in the tubular member can provide cooled blood in the distal direction and when the pressure of fluid within a lumen in the elongated tubular member reaches a predetermined value, the pressure relief means opens to permit fluid to be released from the elongated tubular member.

20 2. The catheter of Claim 1, wherein the pressure relief means comprises a friable membrane.

25 3. The catheter of Claim 1, wherein the pressure relief means comprises a one-way valve.

30 4. The catheter of Claim 1, wherein the pressure relief means comprises an elongated fissure.

5. The catheter of Claim 1, wherein the annular balloon is in fluid communication with an inflation lumen extending longitudinally through the tubular member.

5 6. The catheter of Claim 1, which comprises at least one additional inflatable annular balloon.

7. The catheter of Claim 6, wherein each inflatable annular balloon is in fluid communication with an inflation
10 lumen.

8. The catheter of Claim 1 which also comprises a pressure sensor at or adjacent to the distal end of the catheter.
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9. The catheter of Claim 1 which is useful for brain cooling.

10. The catheter of Claim 1, wherein at least one lumen is
20 in fluid communication with a source of cooled blood.

11. The catheter of Claim 1, wherein at least one lumen is in fluid communication with a liquid pharmaceutical source.

25 12. A catheter for intravascular corporeal cooling comprising:

an elongated tubular member having proximal and distal ends, at least two lumens extending therethrough, and an outer
30 surface, and

two or more inflatable annular balloons arranged on the outer surface of the elongated tubular member, wherein at least one lumen in the tubular member can provide cooled blood in the distal direction and at least two of said inflatable
5 annular balloons are in fluid communication with respective separate inflation lumens.

13. The catheter of Claim 12, wherein there are 3 or 4 adjacent inflatable annular balloons.

14. The catheter of Claim 12, wherein the each inflatable annular balloon is in fluid communication with a separate inflation lumen.

15 15. The catheter of Claim 12, wherein each inflatable lumen is in fluid communication with an inflator capable of inflating and deflating the inflatable annular balloons separately.

20 16. The catheter of Claim 12 which also comprises a pressure sensor at or adjacent to the distal end of the catheter.

25 17. The catheter of Claim 12 which is useful for brain cooling.

18. The catheter of Claim 12, wherein at least one lumen is in fluid communication with a source of cooled blood.

30 19. The catheter of Claim 12, wherein at least one lumen is in fluid communication with a liquid pharmaceutical source.

20. A catheter for intravascular corporeal cooling comprising:

5 an elongated tubular member having proximal and distal sections, an outer surface, and at least one lumen extending therethrough, and

10 annular insulation having proximal and distal ends and arranged concentrically around the outer surface of the elongated external tubular member, whereby at least one lumen in the tubular member can provide cooled blood in the distal direction and fluid flowing through one or more lumens within the elongated external member is insulated from fluid or tissue
15 external to the annular insulation.

20 21. The catheter of Claim 20, wherein the annular insulation extends substantially the entire length of the elongated tubular member.

22. The catheter of Claim 20, wherein the distal end of the annular insulation is tapered.

25 23. The catheter of Claim 20, wherein the annular insulation extends for from about 50 to 80% of the total length of the elongated tubular member.

30 24. The catheter of Claim 20, wherein the annular insulation comprises a fluid-filled tubular member.

25. The catheter of Claim 24, wherein the fluid is water or saline solution.

26. The catheter of Claim 24, wherein the fluid is a gas.

27. The catheter of Claim 20, wherein the annular
5 insulation comprises a tubular member filled with insulative material.

28. The catheter of Claim 27, wherein the insulative material is a synthetic polymeric fill.

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29. The catheter of Claim 20 which also comprises a pressure sensor at or adjacent to the distal end of the catheter.

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30. The catheter of Claim 20 which is useful for brain cooling.

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31. The catheter of Claim 20, wherein at least one lumen is in fluid communication with a source of cooled blood.

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32. The catheter of Claim 20, wherein at least one lumen is in fluid communication with a liquid pharmaceutical source.

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33. A catheter for intravascular corporeal brain cooling
25 comprising:

an elongated tubular member having distal and proximal sections, an outer surface, and at least two lumens extending therethrough, and

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an inflatable, extended annular member positioned on the outer surface of the elongated tubular member and positioned

so that when the corporeal cooling catheter is in position, the annular member is positioned in the patient's aorta, wherein at least one lumen in the tubular member can provide cooled blood in the distal direction.

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34. The catheter of Claim 33, wherein the annular member is in fluid communication with an inflatable lumen.

35. The catheter of Claim 33 which also comprises a
10 pressure sensor at or adjacent to the distal end of the catheter.

36. A catheter set for intravascular corporeal cooling comprising:

15 a first elongated tubular member having proximal and distal ends, and

20 a second tubular member arranged concentrically around the proximal end of the first elongated tubular member and having proximal and distal portions, wherein the distal portion of the second elongated tubular member has openings.

25 37. The catheter of Claim 36, wherein the openings in the distal portion of the second elongated longitudinal tubular member can be varied.

30 38. The catheter of Claim 37 which comprises a third tubular member arranged concentrically around the distal portion of the second tubular member and wherein the openings are varied by rotating and/or sliding the third tubular member over the outer surface of the second tubular member.

39. A catheter for intravascular corporeal cooling comprising:

an elongated tubular member having proximal and distal
5 ends and at least one lumen extending therethrough, an outer surface, and a tubular wall,

two spaced-apart annular balloons arranged on the
outer surface of the distal section of the elongated tubular
10 member, and

a lateral opening in the wall of the tubular member
between the annular balloons, wherein at least one lumen of the
elongated tubular member can provide cooled blood in the distal
15 direction.

40. A method of treating a patient who has had a stroke,
which comprises the steps of

positioning the distal portion of a corporeal cooling
catheter within the patient's internal or external carotid
artery, and

providing cooled blood through said catheter into the
25 internal carotid artery,

wherein the patient is treated within sufficient time after
the stroke to minimize or prevent cardiovascular, muscular, or
neural insult or damage.

41. The method of Claim 40, wherein the patient is treated
within twelve hours after the stroke.

42. A method of treating, minimizing, or avoiding renal failure in a patient, comprising the steps of

5 positioning the distal portion of a corporeal cooling catheter into a renal artery of the patient, and

providing cooled blood through said catheter into the renal artery.

10 43. The method of Claim 40 or 42, wherein the catheter is a catheter of Claim 12.

15 44. The method of Claim 40 or 42, wherein the catheter is a catheter of Claim 9.

45. The method of Claim 40 or 42, wherein the catheter is a catheter of Claim 20.

20 46. The method of Claim 40 or 42, wherein the catheter is a catheter of Claim 33.